



US009636076B2

(12) **United States Patent**
Fujisawa et al.

(10) **Patent No.:** **US 9,636,076 B2**

(45) **Date of Patent:** ***May 2, 2017**

(54) **X-RAY CT APPARATUS AND IMAGE
PROCESSING METHOD**

(58) **Field of Classification Search**

None

See application file for complete search history.

(71) Applicant: **TOSHIBA MEDICAL SYSTEMS
CORPORATION**, Otawara (JP)

(56) **References Cited**

(72) Inventors: **Yasuko Fujisawa**, Otawara (JP);
Shinsuke Tsukagoshi, Nasushiobara
(JP); **Shinji Muramatsu**, Otawara (JP);
Takumi Ishizaka, Yaita (JP)

U.S. PATENT DOCUMENTS

7,946,992 B2 5/2011 Umemura et al.
8,098,921 B2 1/2012 Matsumura

(Continued)

(73) Assignee: **TOSHIBA MEDICAL SYSTEMS
CORPORATION**, Otawara-shi (JP)

FOREIGN PATENT DOCUMENTS

(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 0 days.

EP 1 880 673 A1 1/2008
EP 1 980 210 A1 10/2008
JP 4861647 11/2011

This patent is subject to a terminal dis-
claimer.

OTHER PUBLICATIONS

European Office Action issued Sep. 9, 2014 in European Patent
Application No. 12162302.9-1906.

(Continued)

(21) Appl. No.: **14/953,231**

(22) Filed: **Nov. 27, 2015**

(65) **Prior Publication Data**

US 2016/0073994 A1 Mar. 17, 2016

Primary Examiner — Soo Jin Park

(74) *Attorney, Agent, or Firm* — Oblon, McClelland,
Maier & Neustadt, L.L.P.

Related U.S. Application Data

(63) Continuation-in-part of application No. 13/431,097,
filed on Mar. 27, 2012, now Pat. No. 9,230,334.

(30) **Foreign Application Priority Data**

Mar. 29, 2011 (JP) 2011-072805

(51) **Int. Cl.**

G06K 9/00 (2006.01)

A61B 6/00 (2006.01)

(Continued)

(52) **U.S. Cl.**

CPC **A61B 6/5217** (2013.01); **G06T 7/0016**
(2013.01); **G06T 7/246** (2017.01);

(Continued)

(57) **ABSTRACT**

An X-ray CT apparatus according to an embodiment
includes an image processing circuit. The image processing
circuit generates image data of an inside of a patient. The
image processing circuit specifies a position of a tumor and
a position of a surrounding site positioned in a surrounding
of the tumor, from the generated pieces of image data. The
image processing circuit calculates movement information
related to movements of the tumor and the surrounding site,
based on the specified positions of the tumor and the
surrounding site. The image processing circuit calculates a
relative relationship between the calculated movement infor-
mation of the tumor and the surrounding site. The imaging
processing circuit calculates a degree of coupling by which
the tumor and the surrounding site are coupled, based on a

(Continued)

